OBSERVATIONS ON ASBESTOS RELEASE DURING DEMOLITION ACTIVITIES

by

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INTRODUCTION

The U.S. Environmental Protection Agency's Risk Reduction Engineering Laboratory (RREL) monitored block-wide building demolition and debris disposal activities at Santa Cruz and Watsonville, California following the 1989 earthquake, an implosion demolition of a 26-story building in Cincinnati, Ohio, the demolition of eight wooden barracks at Fort Bliss, Texas, and the demolition of two school buildings in Fairbanks, Alaska to evaluate if the demolition activities and their associated dust control practices were able to prevent downwind elevations of asbestos concentrations.

The analyses of the ambient air samples were performed by the RREL Electron Microscopy facility using the Transmission Electron Microscope (TEM). Personnel monitoring at the Santa Cruz landfill and the Fairbanks landfill during disposal activities were analyzed by both TEM and phase contrast microscopy (PCM).

This paper will summarize the conditions of the buildings, demolition practices, dust control practices, and up and downwind asbestos concentrations during demolition.

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California Earthquake

After the 1989 California earthquake, condemned buildings were being rapidly demolished. The Monterey Bay Unified Air Pollution Control District and EPA Region IX asked RREL to evaluate the effectiveness of control practices used during demolition in preventing significant airborne asbestos release to the communities involved. RREL monitored two demolition activities -- one in the Pacific Garden Mall in Santa Cruz and one in downtown Watsonville. In both locations, building construction was similar, namely mostly two-story brick buildings with common walls to the adjacent building. The existence of asbestos in the structures had to be presumed, because access to the insides of the buildings for observations and bulk sampling was prohibited for safety reasons. Since asbestos existed in similar, undamaged buildings, it was presumed to exist in the demolition areas as well. Typical asbestos-containing materials in adjacent buildings consisted of vinyl asbestos tile and thermal system insulation on pipes and boilers. Control practices consisted of spraying the demolition site with water from fire-hoses while demolition dozers, endloaders, and trucks were operating. In Santa Cruz (Figure 1), the demolition activity released minimal asbestos. In Watsonville, slightly higher levels (Figure 2) were measured downwind of the demolition, probably because a three-story building came crashing to the ground during the monitoring period.

At Santa Cruz, the demolition debris was taken to the local municipal landfill, causing local interest in the potential for worker exposure. At the request of the Monterey Bay Unified Air Pollution Control District, we monitored a day's activity at the dump. As seen in Figure 3, no difference increase was seen between the up and downwind asbestos levels using TEM analyses; however, TEM analyses of personal samples taken on the dozer operator revealed elevated

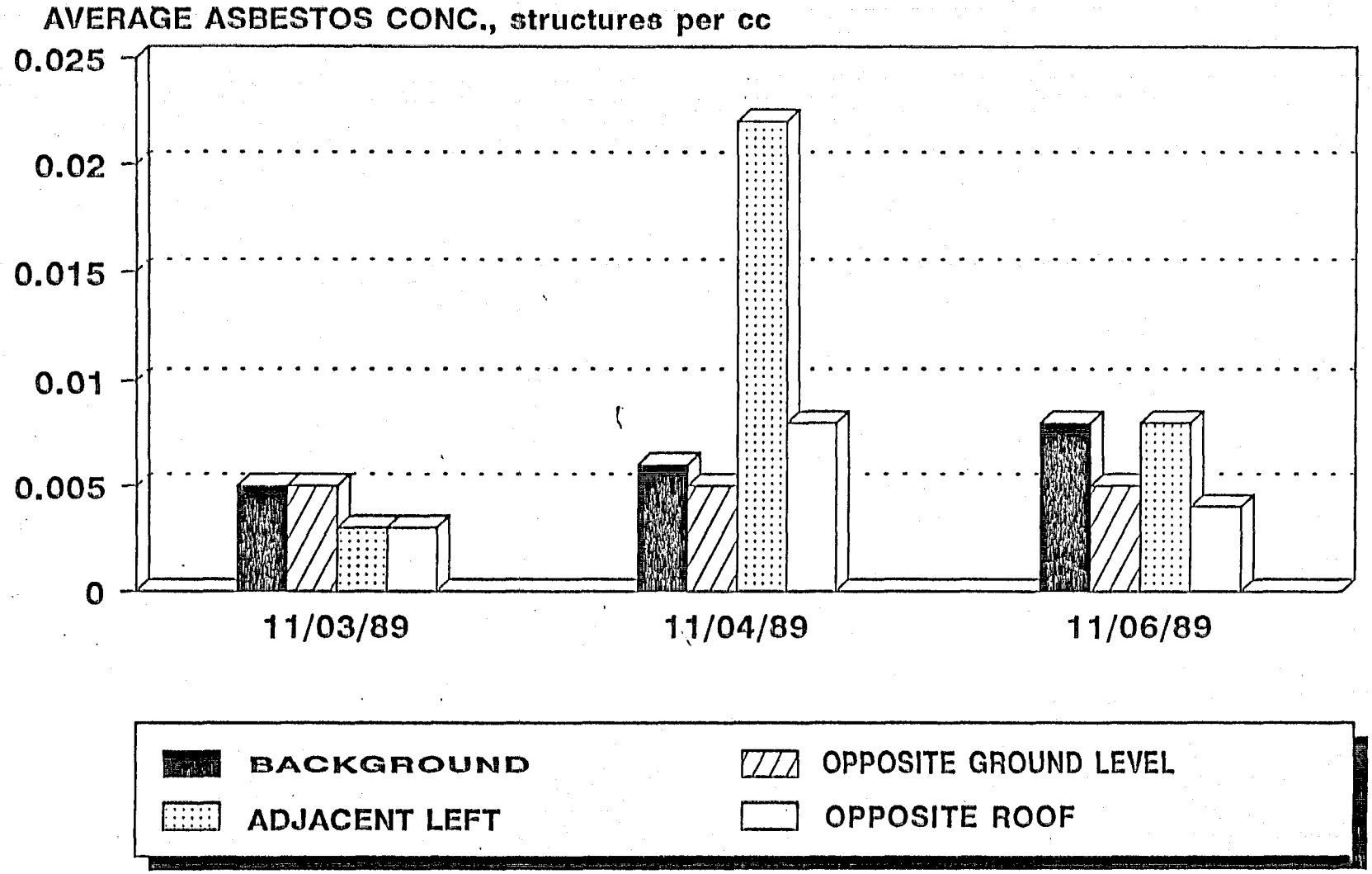

Figure 1. Average airborne asbestos concentrations during building demolition at the Pacific Garden Mall in Santa Cruz, California.

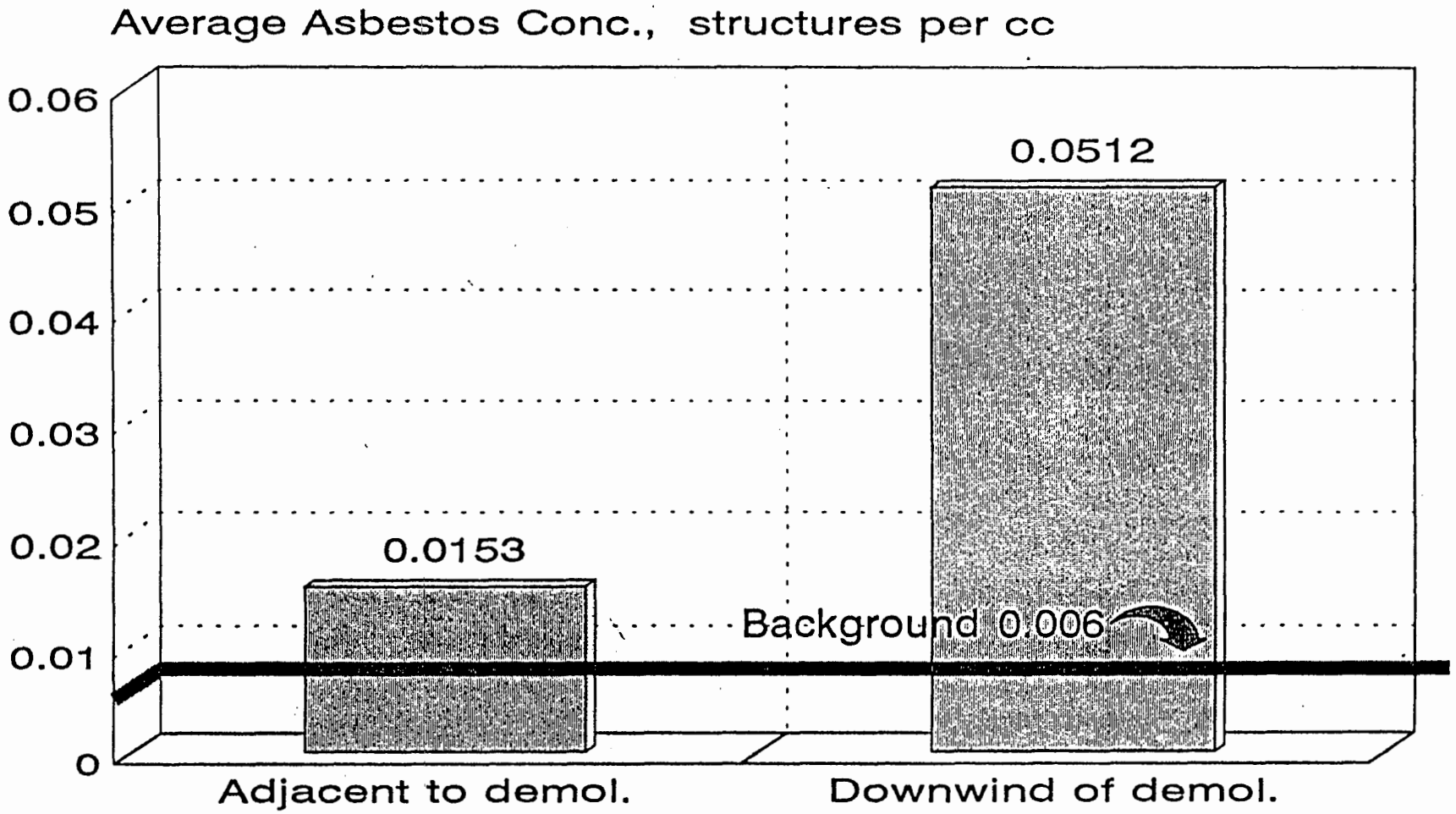

Figure 2. Average airborne asbestos concentration during demolition of a building in Watsonville, California.

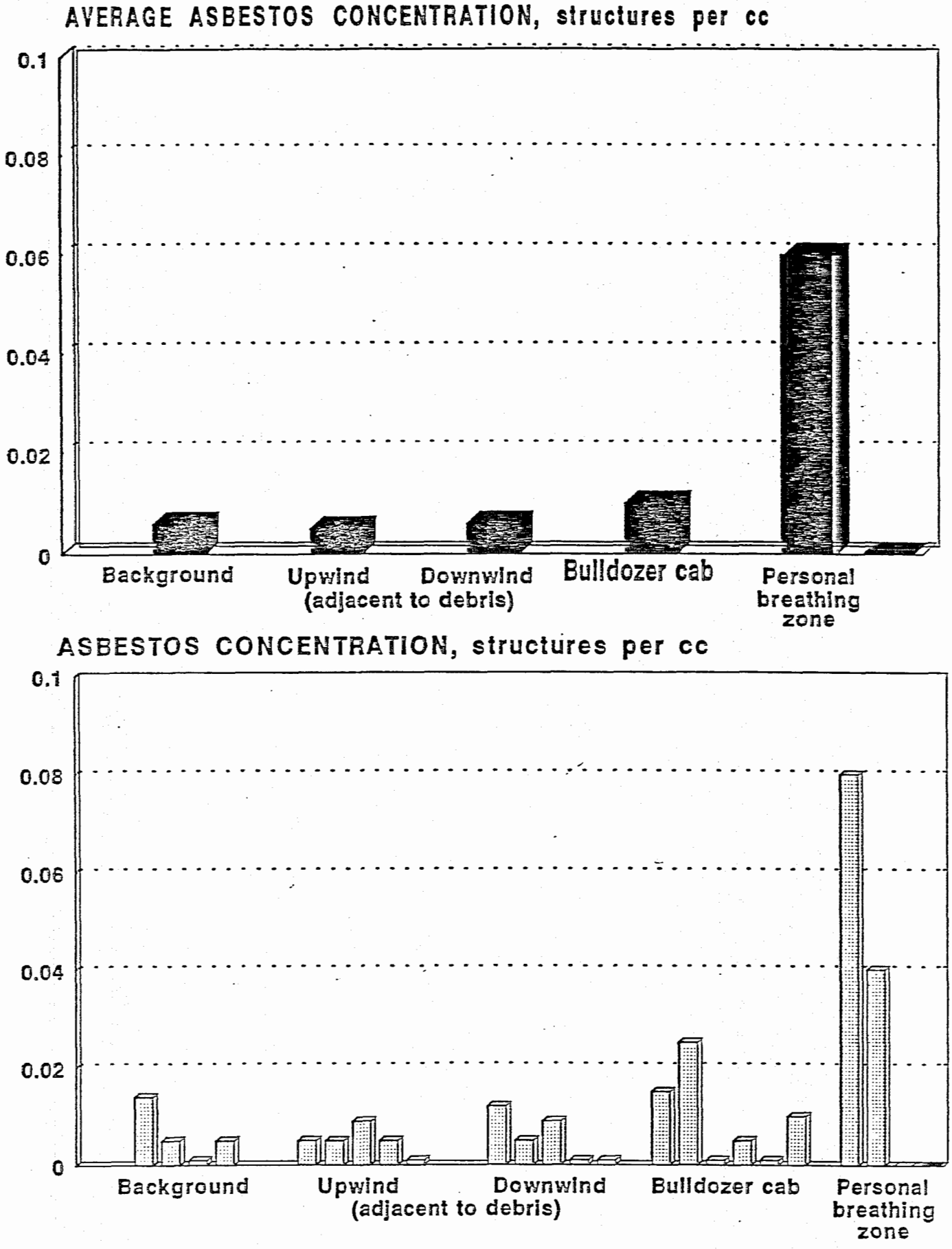

Figure 3. Average (top) and individual (bottom) airborne asbestos concentrations during the landfilling of demolition debris at the Santa Cruz municipal landfill.

levels. It is important to note that PCM counts on these samples were below the limit of detection, i.e., within compliance as far as PCM and the OSHA regulations are concerned.

Visible emissions were observed during the structural collapse of buildings but were generally not apparent during loading operations when fire-hoses were used to wet the debris. There were, however, measured asbestos levels (statistically significant) above background during the handling of debris even though there were no visible emissions.

These limited data support the premise in the National Emission Standards for Hazardous Air Pollutants (NESHAP) (Proposed Rules, January 10, 1989; 40CFR Part 61, page 925) that the absence of visible emission is not sufficient evidence to assume no fugitive particulate emission.

Implosion

RREL was able to monitor an implosion-type demolition of a 26-story building in which all known asbestos (other than vinyl asbestos tile) had been removed in full accordance with the provisions of the applicable asbestos NESHAP. The resulting data (Figure 4) showed initially elevated airborne asbestos levels downwind of the site, which rapidly decreased in concentration. In fact, the first samples were so heavily loaded with particulate that it was not possible to analyze them by our standard technique.

We have no way to assure that *all* the friable asbestos was in fact removed from all nooks and crannies of the building, nor are we able to comment on the ability to *totally remove all friable* materials. Our conclusion was that the forces involved in the spontaneous collapse of a 26-story building provide sufficient energy to make non-friable materials friable (such as vinyl asbestos tile) and this contributed to the observed asbestos concentration at the time of

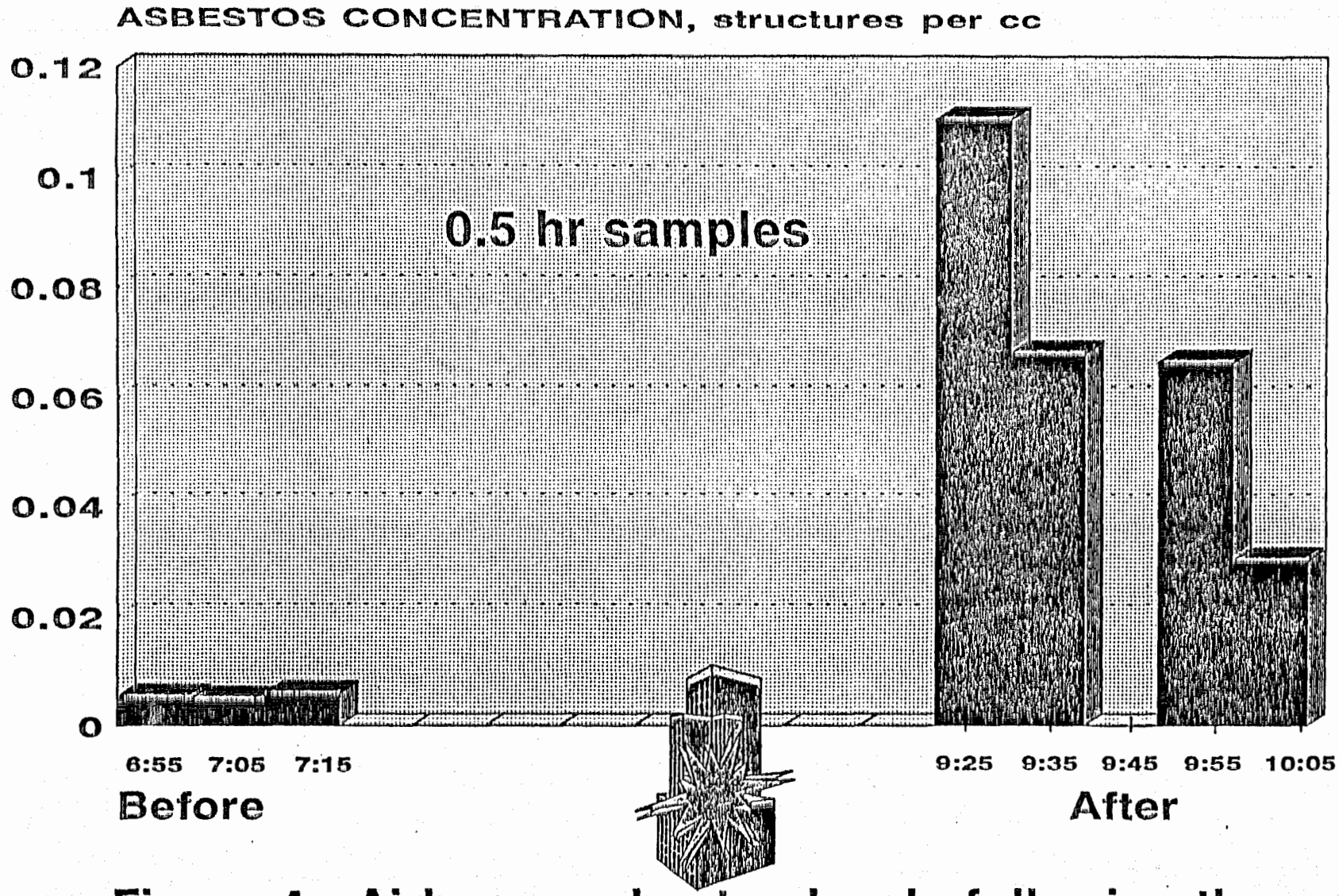

Figure 4. Airborne asbestos levels following the implosion/demolition of a 26-story building in Cincinnati, Ohio.

the demolition. No control options (such as wetting) were utilized during this demolition; it is difficult, however, to envision control technologies that would be 100 percent effective in preventing asbestos release considering the massive forces involved in this demolition mode.

U.S. Army -- Fort Bliss, El Paso, Texas

RREL assisted the U.S. Army Corps of Engineers, Tulsa District, in evaluating asbestos release during demolition of several wooden barracks in which the only known asbestos remaining in the building was vinyl asbestos tile that contained as much as 20 percent chrysotile asbestos, over mastic that contained 15 percent asbestos. No wetting was used during the demolition process. This work was done under the auspices of a Federal Agency Asbestos Workgroup known as the Asbestos Development and Demonstration Initiatives Group (ADDIG), which is comprised of EPA, several other Federal Agencies, and many components of the Department of Defense (including the Air Force, Navy, Army, and DOD Dependents Schools). Results of this study have not yet been officially released by the Corps of Engineers, but should be available in the near future. Richard Caldwell of the Navy described some preliminary results in an article in the *Navy Civil Engineer* where "Test results showed no significant increase in airborne asbestos fiber concentrations when upwind and downwind concentrations were compared from time periods during demolition and loading". Rick Smith of the Army Corps of Engineers told us that the PCM levels were all below detection, but that small levels of asbestos were observed by TEM. For additional definitive information on this, contact Rick Smith at (918) 581-6148.

U.S. Army -- Fort Wainright, Alaska

RREL assisted U.S. EPA Region X and the Fairbanks North Star Borough in evaluating asbestos release from the demolition of two school buildings at Fort Wainwright in Fairbanks, Alaska. As in the other sites, all friable asbestos had been removed from both buildings in accordance with the asbestos NESHAP, leaving only vinyl asbestos tile. The demolition was done by large backhoes and front-end loaders that loaded the debris into trucks for transportation to the dump. EPA monitored emissions from the site and Mike Taylor, a Certified Industrial Hygienist with the Fairbanks North Star Borough, monitored the worker (equipment operator) exposure. The demolition workers made an attempt during the study to wet the debris with water from a tank truck during active demolition. Their attempts to really wet the material were less than satisfactory as there was simply an insufficient amount of water volume and pressure to accomplish the task satisfactorily. Nature assisted somewhat in this regard as there was intermittent rain during the demolition of the first building. At the time of this paper, data are available only for the first of the two demolitions in Fairbanks.

Mike Taylor reports that the worker exposure levels as determined by PCM were all below the OSHA action level of one fiber/cc. TEM levels from the first of the two buildings (Figure 5) averaged well below 0.005 asbestos structures/cc, which is negligible, and there was no statistical difference between the up and downwind asbestos levels. A single spike of asbestos release was observed in one sample. There were no significant releases of asbestos observed by TEM analysis in the downwind samples at the dump site.

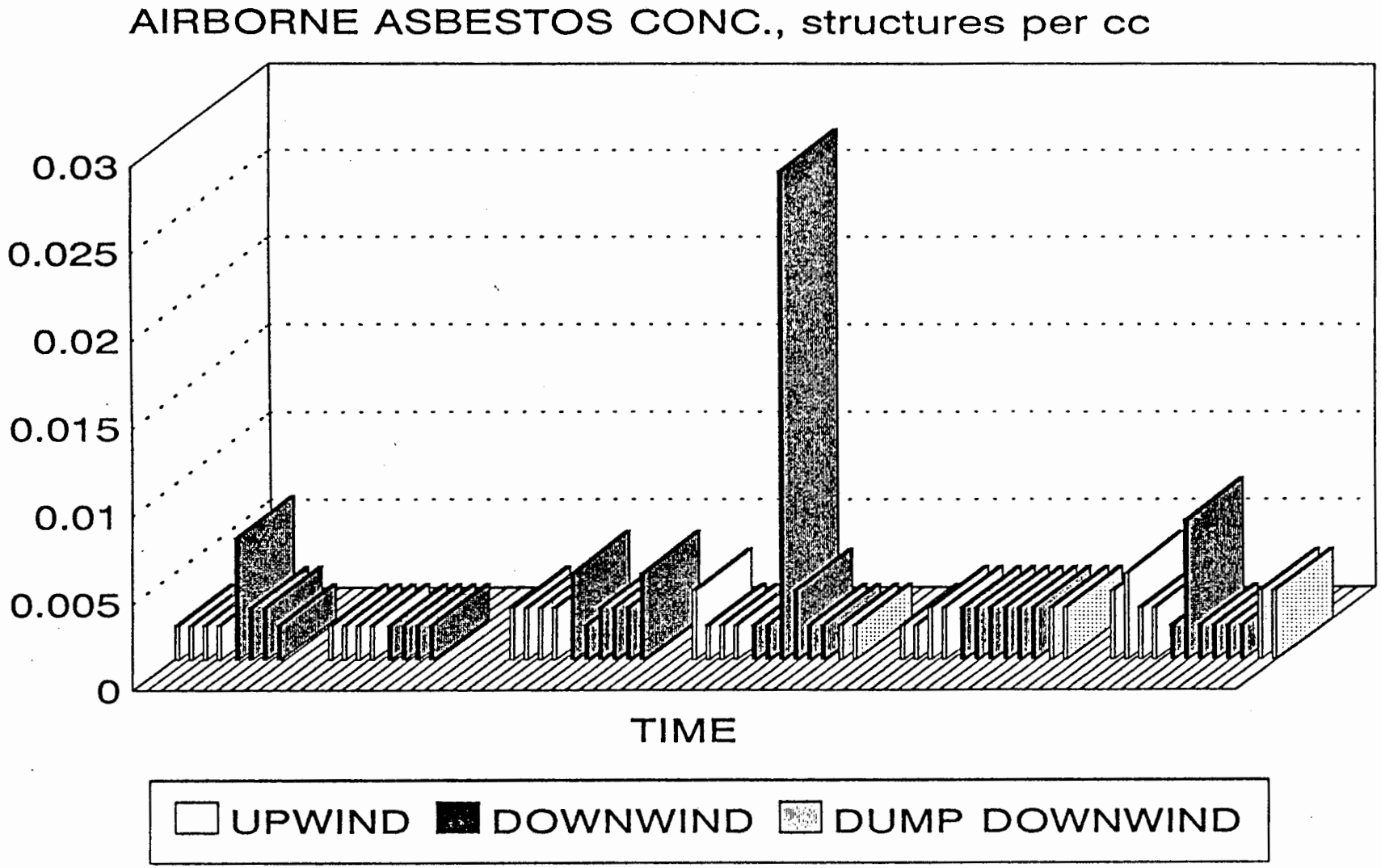

Figure 5. Asbestos release from demolition of the Ft. Wainwright Elementary School in Fairbanks, Alaska.

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16. ABSTRACT

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The paper will document the conditions of the buildings, demolition practices, dust control practices, and up and downwind asbestos concentrations during demolition.

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